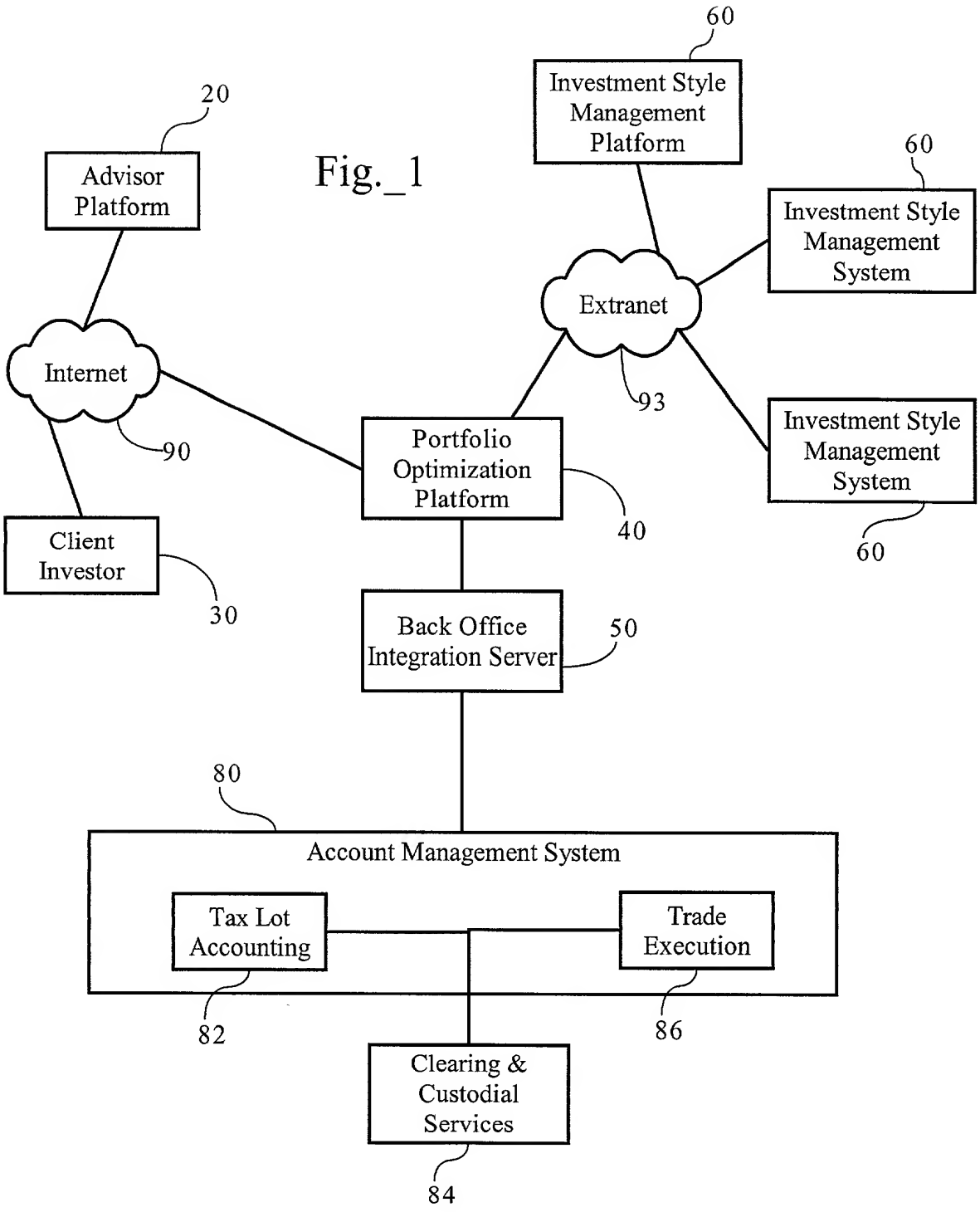

60
Investment Style Management Platform
20
Advisor Platform
60
Investment Style Management System
Extranet
Internet
93
90
Portfolio Optimization Platform
Investment Style Management System
40
60
Client Investor
30
Back Office Integration Server
50
80
Account Management System
Tax Lot Accounting
Trade Execution
82
86
Clearing & Custodial Services
84

Fig._1

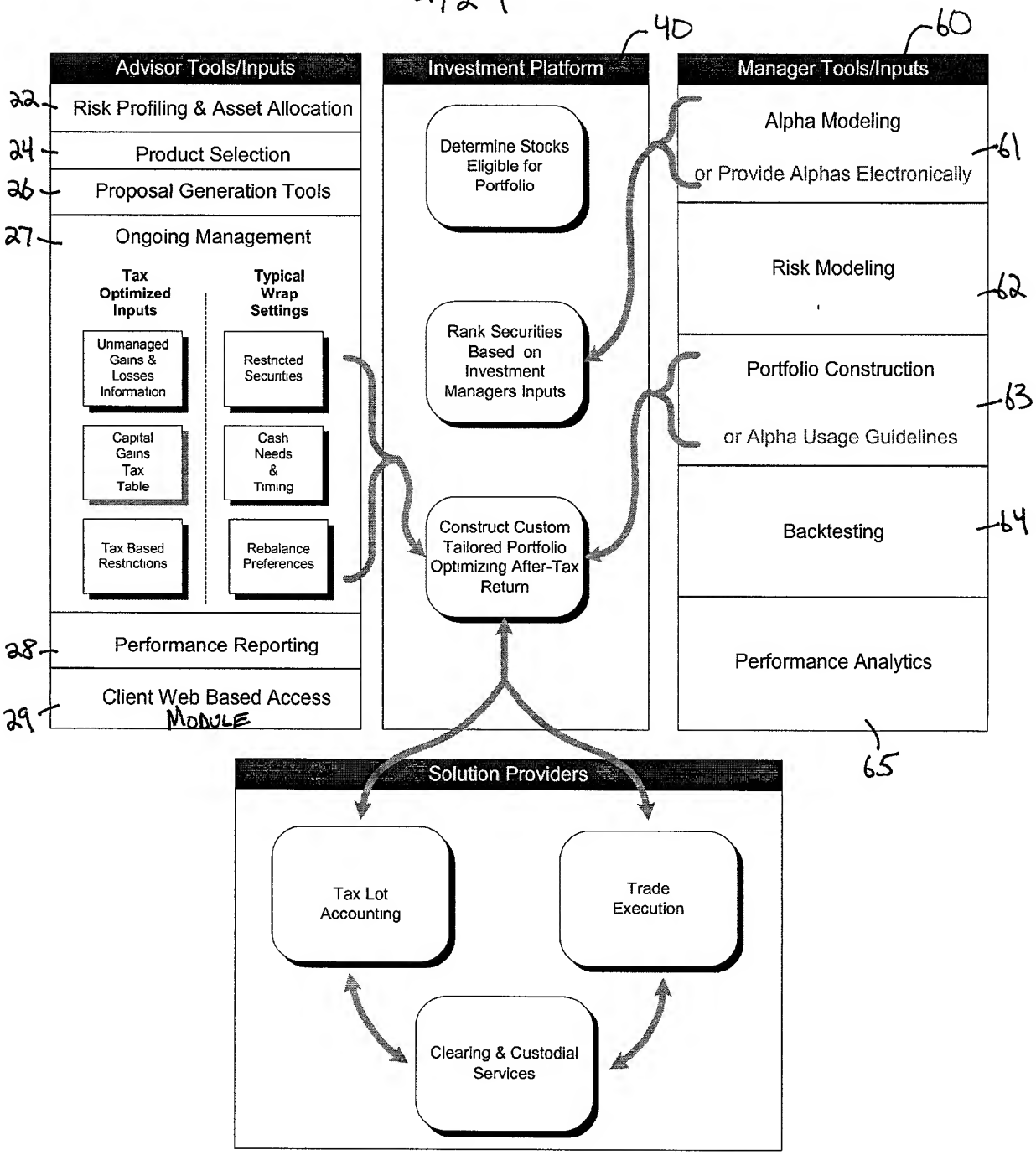

Advisor Tools/Inputs
Investment Platform
Manager Tools/Inputs
40
60
22
Risk Profiling & Asset Allocation
24
Product Selection
26
Proposal Generation Tools
27
Ongoing Management
Tax Optimized Inputs
Typical Wrap Settings
Unmanaged Gains & Losses Information
Capital Gains Tax Table
Tax Based Restrictions
Restricted Securities
Cash Needs & Timing
Rebalance Preferences
28
Performance Reporting
29
Client Web Based Access
MODULE
Determine Stocks Eligible for Portfolio
Rank Securities Based on Investment Managers Inputs
Construct Custom Tailored Portfolio Optimizing After-Tax Return
Alpha Modeling
or Provide Alphas Electronically
61
Risk Modeling
62
Portfolio Construction
or Alpha Usage Guidelines
63
Backtesting
64
Performance Analytics
65
Solution Providers
Tax Lot Accounting
Trade Execution
Clearing & Custodial Services

Fig._2

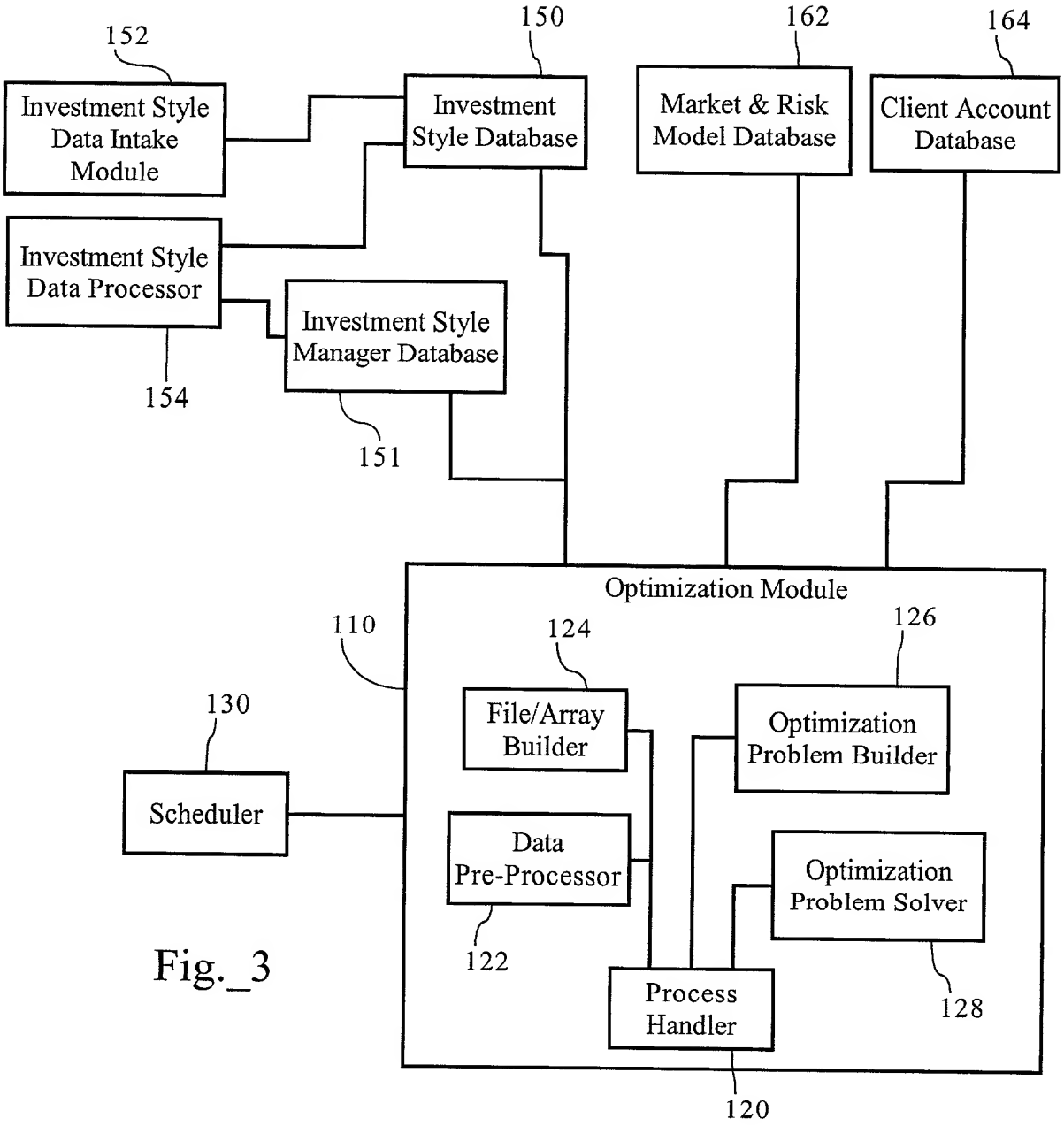

152
150
162
164
Investment Style Data Intake Module
Investment Style Database
Market & Risk Model Database
Client Account Database
Investment Style Data Processor
Investment Style Manager Database
154
151
Optimization Module
110
124
126
130
File/Array Builder
Optimization Problem Builder
Scheduler
Data Pre-Processor
Optimization Problem Solver
122
128
Process Handler
120

Fig._3

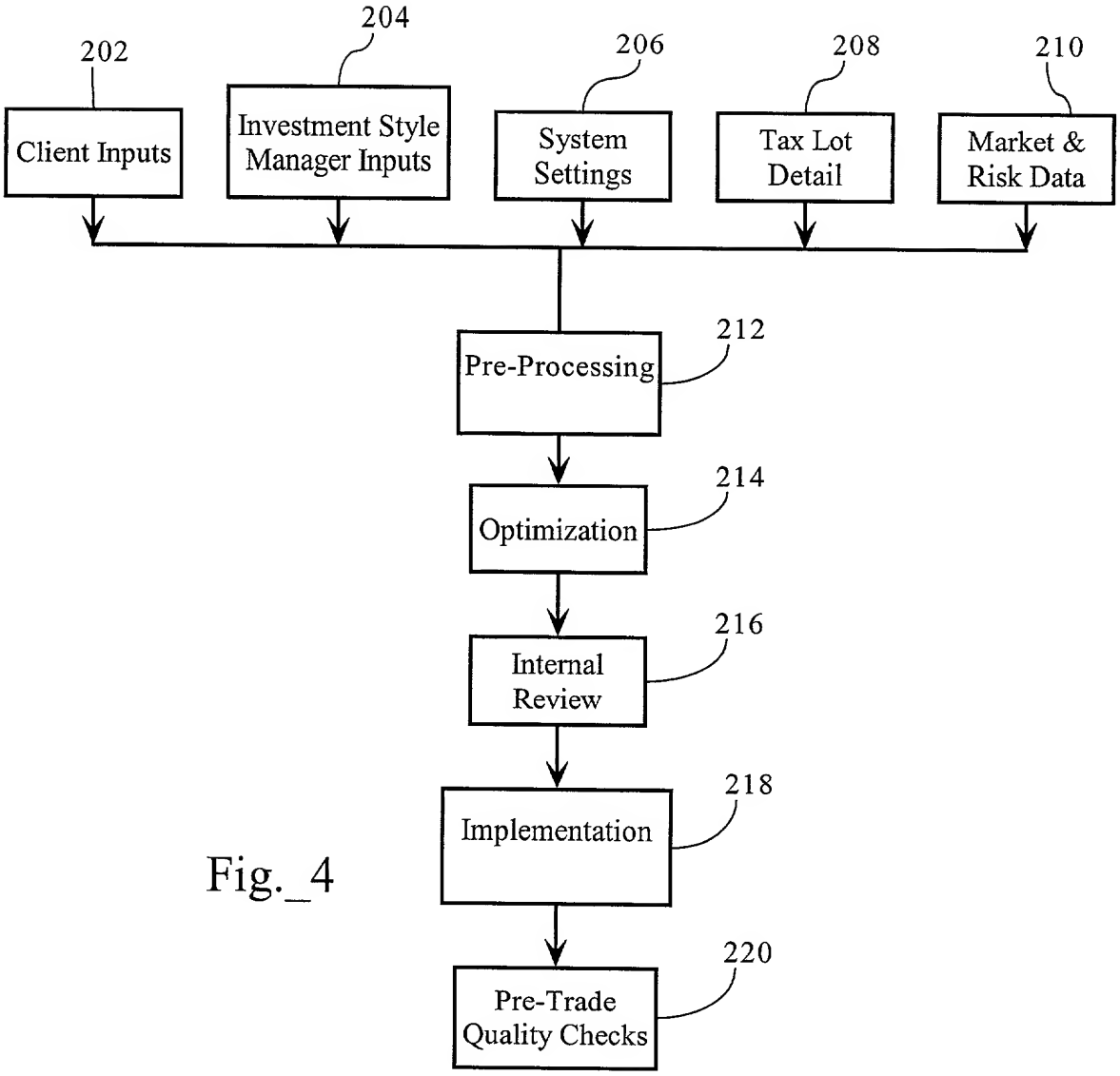

202
Client Inputs
204
Investment Style Manager Inputs
206
System Settings
208
Tax Lot Detail
210
Market & Risk Data
212
Pre-Processing
214
Optimization
216
Internal Review
218
Implementation
220
Pre-Trade Quality Checks

Fig._4

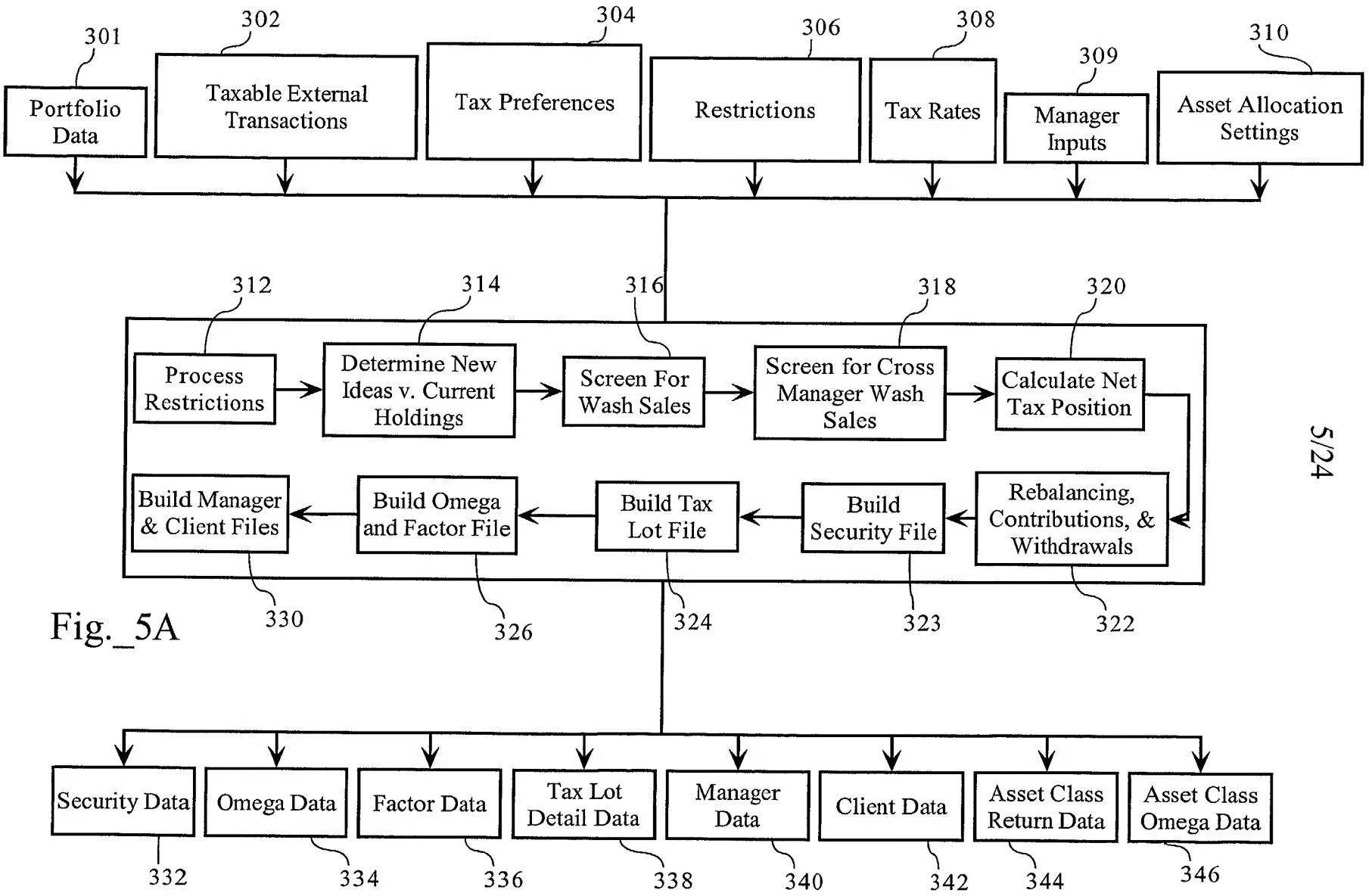

301
Portfolio Data
302
Taxable External Transactions
304
Tax Preferences
306
Restrictions
308
Tax Rates
309
Manager Inputs
310
Asset Allocation Settings
312
Process Restrictions
314
Determine New Ideas v. Current Holdings
316
Screen For Wash Sales
318
Screen for Cross Manager Wash Sales
320
Calculate Net Tax Position
322
Rebalancing, Contributions, & Withdrawals
323
Build Security File
324
Build Tax Lot File
326
Build Omega and Factor File
330
Build Manager & Client Files
332
Security Data
334
Omega Data
336
Factor Data
338
Tax Lot Detail Data
340
Manager Data
342
Client Data
344
Asset Class Return Data
346
Asset Class Omega Data

Fig._5A

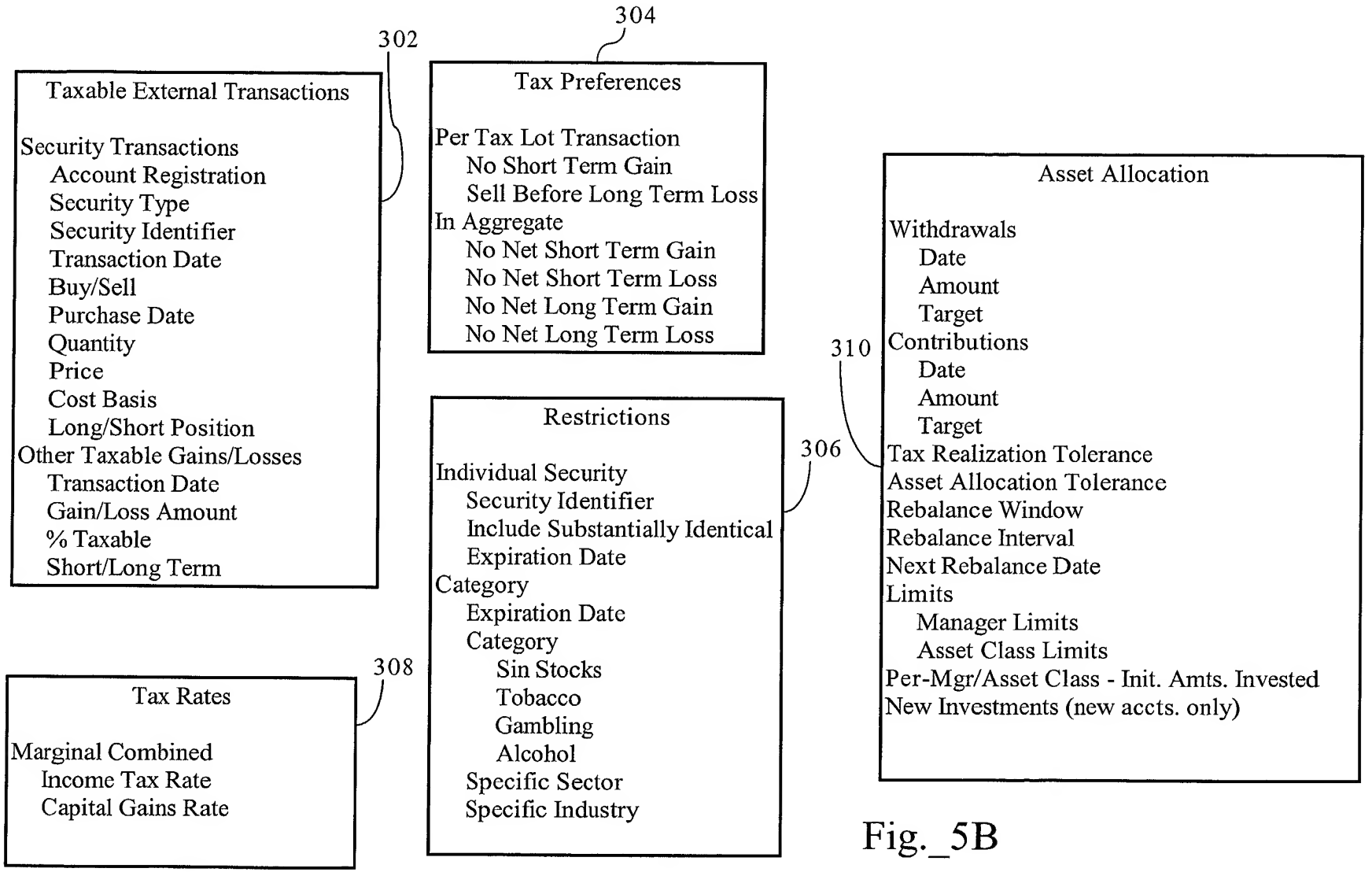

302
Taxable External Transactions
Security Transactions
Account Registration
Security Type
Security Identifier
Transaction Date
Buy/Sell
Purchase Date
Quantity
Price
Cost Basis
Long/Short Position
Other Taxable Gains/Losses
Transaction Date
Gain/Loss Amount
% Taxable
Short/Long Term
304
Tax Preferences
Per Tax Lot Transaction
No Short Term Gain
Sell Before Long Term Loss
In Aggregate
No Net Short Term Gain
No Net Short Term Loss
No Net Long Term Gain
No Net Long Term Loss
Restrictions
Individual Security
Security Identifier
Include Substantially Identical
Expiration Date
Category
Expiration Date
Category
Sin Stocks
Tobacco
Gambling
Alcohol
Specific Sector
Specific Industry
306
308
Tax Rates
Marginal Combined
Income Tax Rate
Capital Gains Rate
310
Asset Allocation
Withdrawals
Date
Amount
Target
Contributions
Date
Amount
Target
Tax Realization Tolerance
Asset Allocation Tolerance
Rebalance Window
Rebalance Interval
Next Rebalance Date
Limits
Manager Limits
Asset Class Limits
Per-Mgr/Asset Class - Init. Amts. Invested
New Investments (new accts. only)

Fig._5B

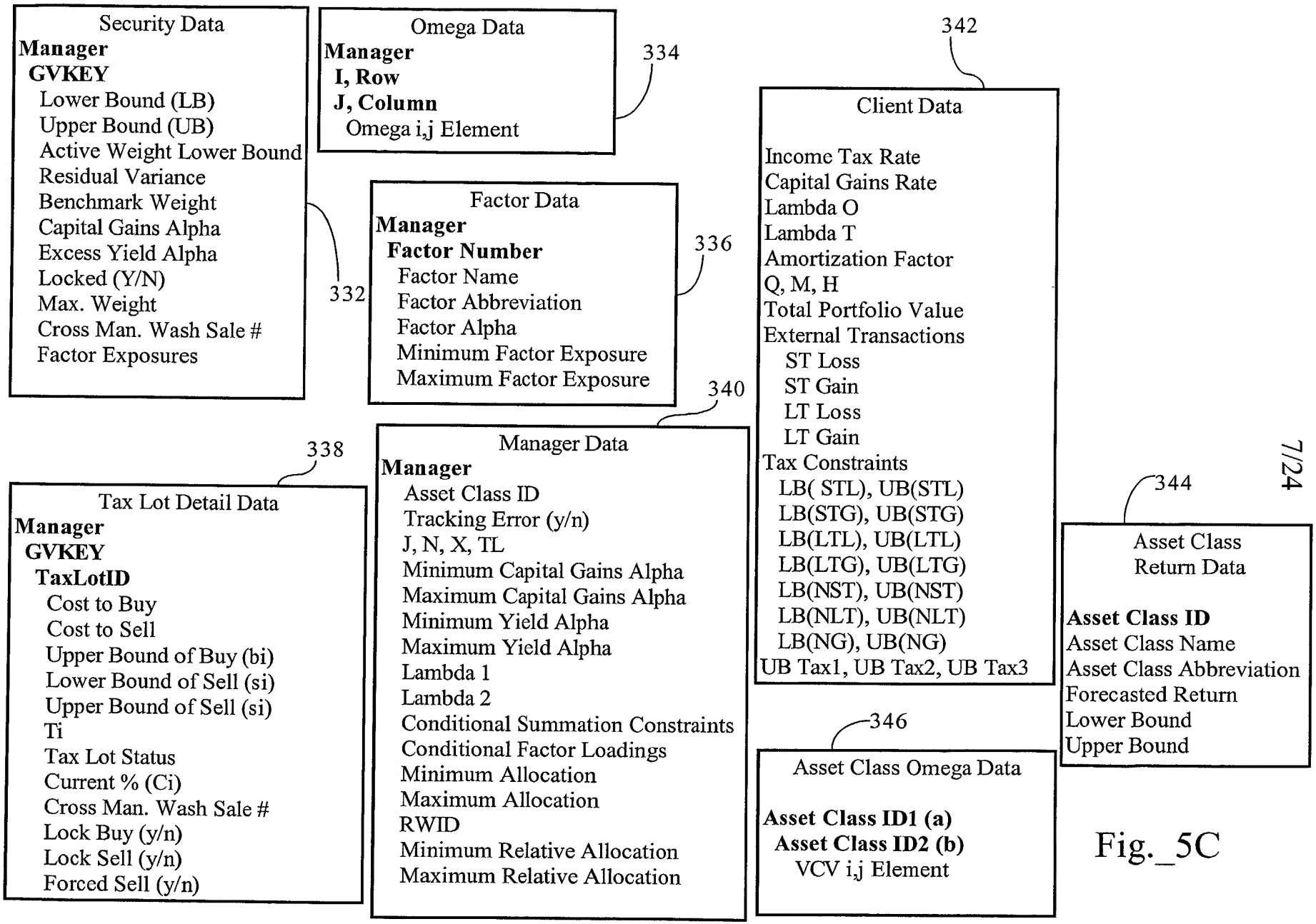

Security Data
Manager
GVKEY
Lower Bound (LB)
Upper Bound (UB)
Active Weight Lower Bound
Residual Variance
Benchmark Weight
Capital Gains Alpha
Excess Yield Alpha
Locked (Y/N)
Max. Weight
Cross Man. Wash Sale #
Factor Exposures
332
Omega Data
Manager
I, Row
J, Column
Omega i,j Element
334
Factor Data
Manager
Factor Number
Factor Name
Factor Abbreviation
Factor Alpha
Minimum Factor Exposure
Maximum Factor Exposure
336
Tax Lot Detail Data
Manager
GVKEY
TaxLotID
Cost to Buy
Cost to Sell
Upper Bound of Buy (bi)
Lower Bound of Sell (si)
Upper Bound of Sell (si)
Ti
Tax Lot Status
Current % (Ci)
Cross Man. Wash Sale #
Lock Buy (y/n)
Lock Sell (y/n)
Forced Sell (y/n)
338
Manager Data
Manager
Asset Class ID
Tracking Error (y/n)
J, N, X, TL
Minimum Capital Gains Alpha
Maximum Capital Gains Alpha
Minimum Yield Alpha
Maximum Yield Alpha
Lambda 1
Lambda 2
Conditional Summation Constraints
Conditional Factor Loadings
Minimum Allocation
Maximum Allocation
RWID
Minimum Relative Allocation
Maximum Relative Allocation
340
Client Data
Income Tax Rate
Capital Gains Rate
Lambda O
Lambda T
Amortization Factor
Q, M, H
Total Portfolio Value
External Transactions
ST Loss
ST Gain
LT Loss
LT Gain
Tax Constraints
LB(STL), UB(STL)
LB(STG), UB(STG)
LB(LTL), UB(LTL)
LB(LTG), UB(LTG)
LB(NST), UB(NST)
LB(NLT), UB(NLT)
LB(NG), UB(NG)
UB Tax1, UB Tax2, UB Tax3
342
Asset Class Omega Data
Asset Class ID1 (a)
Asset Class ID2 (b)
VCV i,j Element
346
Asset Class Return Data
Asset Class ID
Asset Class Name
Asset Class Abbreviation
Forecasted Return
Lower Bound
Upper Bound
344

Fig._5C

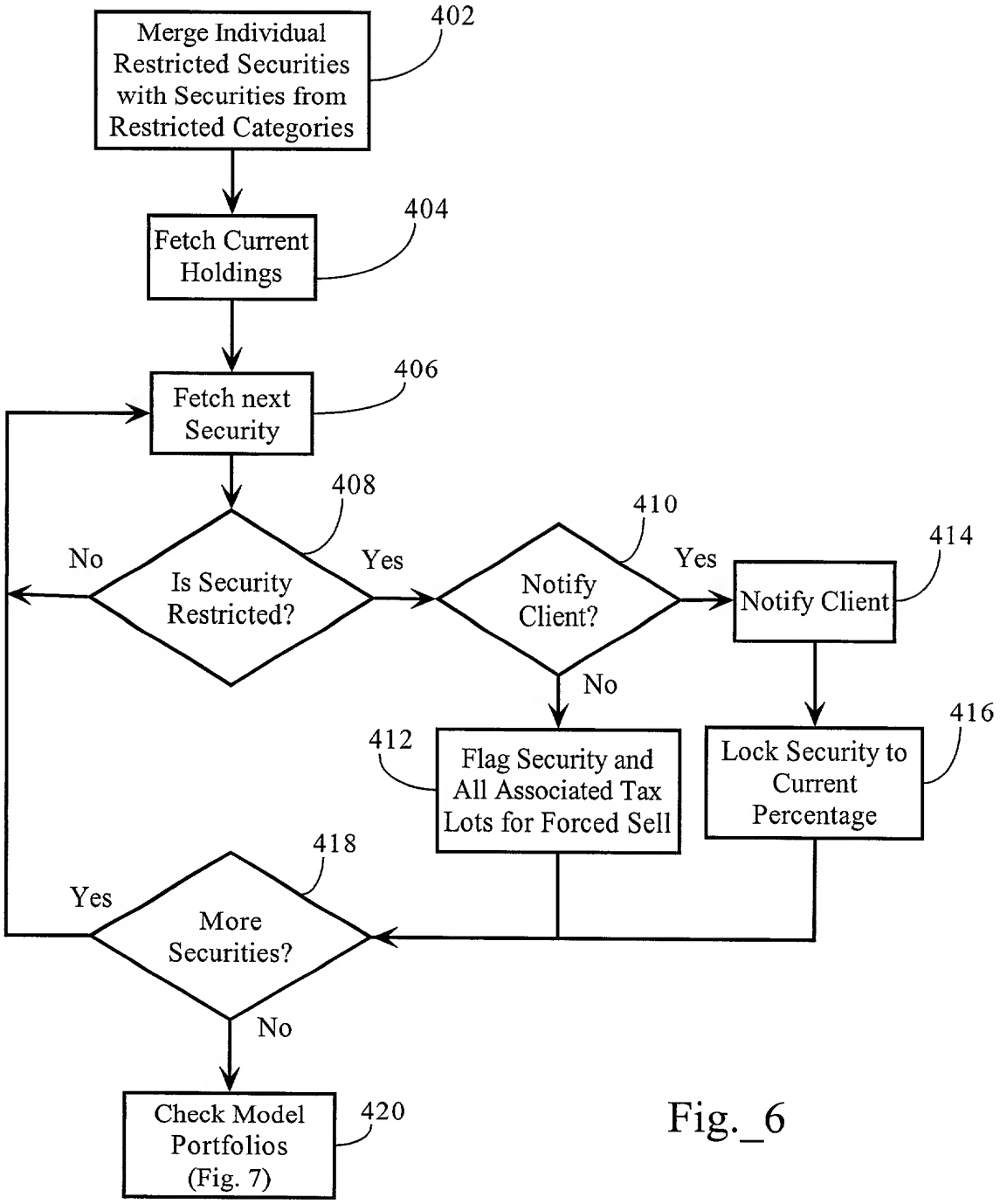

Merge Individual Restricted Securities with Securities from Restricted Categories
402
Fetch Current Holdings
404
Fetch next Security
406
Is Security Restricted?
408
No
Yes
Notify Client?
410
Yes
Notify Client
414
No
Flag Security and All Associated Tax Lots for Forced Sell
412
Lock Security to Current Percentage
416
More Securities?
418
Yes
No
Check Model Portfolios (Fig. 7)
420

Fig._6

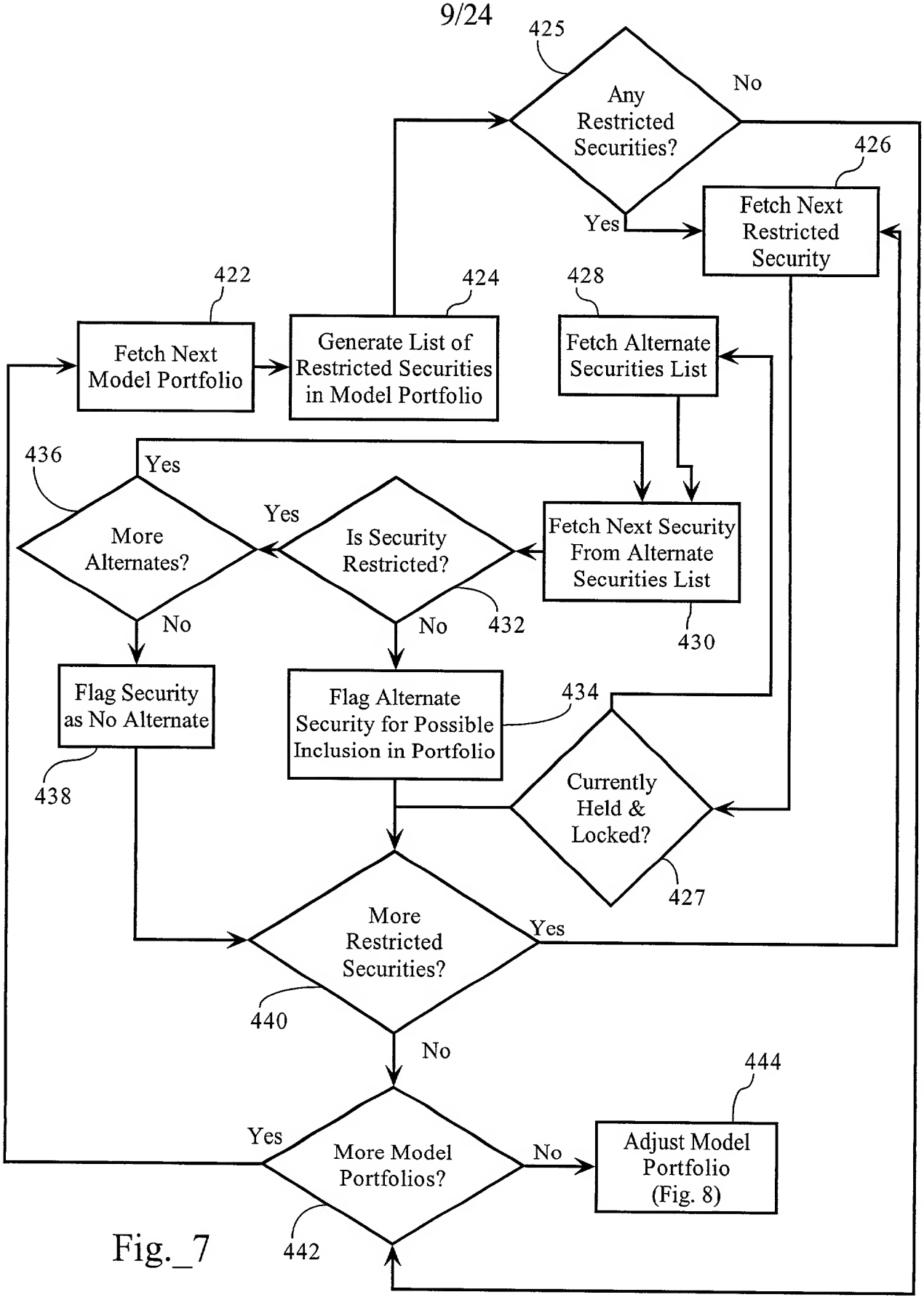

425
Any Restricted Securities?
No
Yes
426
Fetch Next Restricted Security
422
Fetch Next Model Portfolio
424
Generate List of Restricted Securities in Model Portfolio
428
Fetch Alternate Securities List
436
Yes
More Alternates?
Yes
Is Security Restricted?
Fetch Next Security From Alternate Securities List
No
No
432
430
Flag Security as No Alternate
Flag Alternate Security for Possible Inclusion in Portfolio
434
438
Currently Held & Locked?
427
More Restricted Securities?
Yes
440
No
444
Yes
More Model Portfolios?
No
Adjust Model Portfolio (Fig. 8)
442

Fig._7

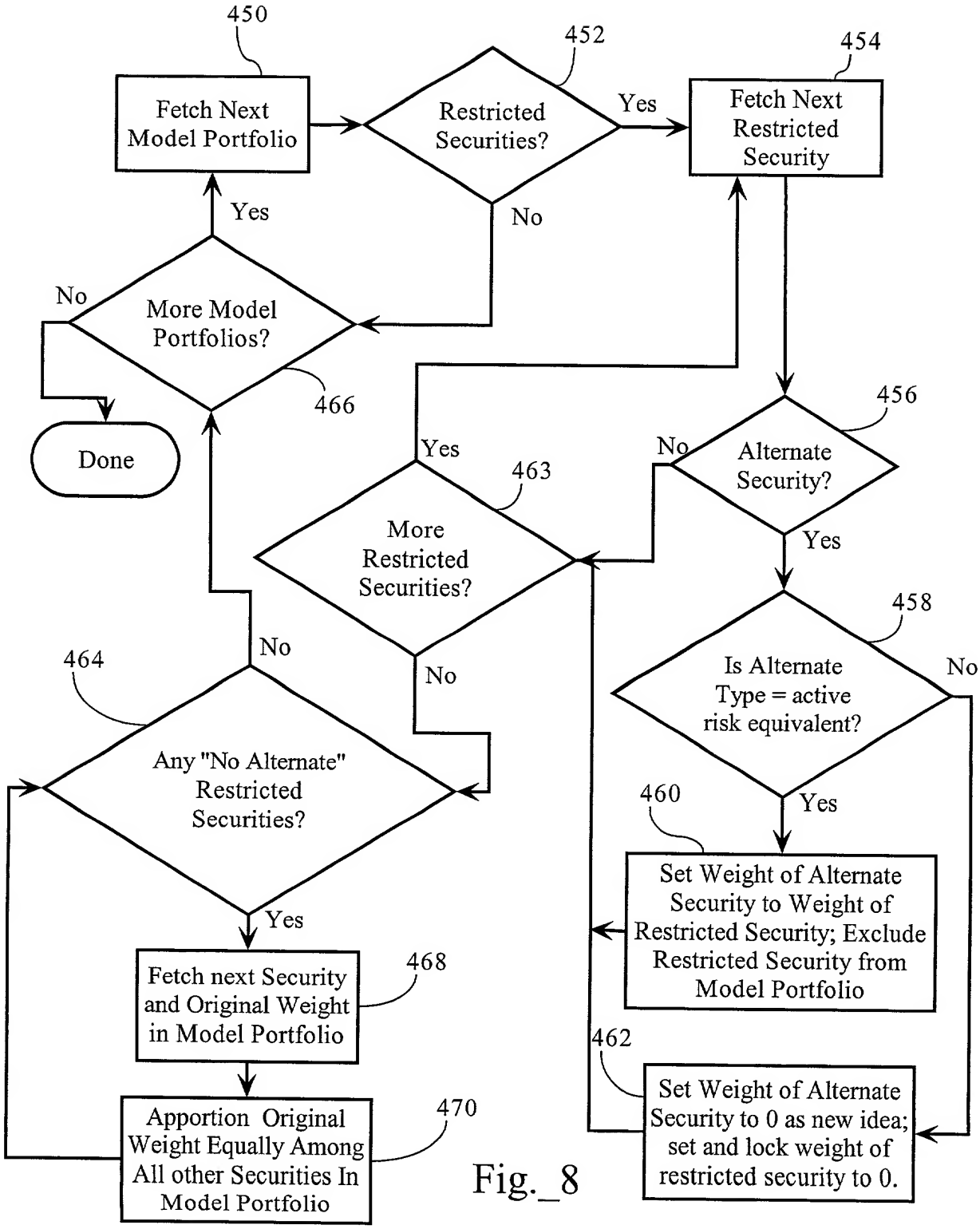
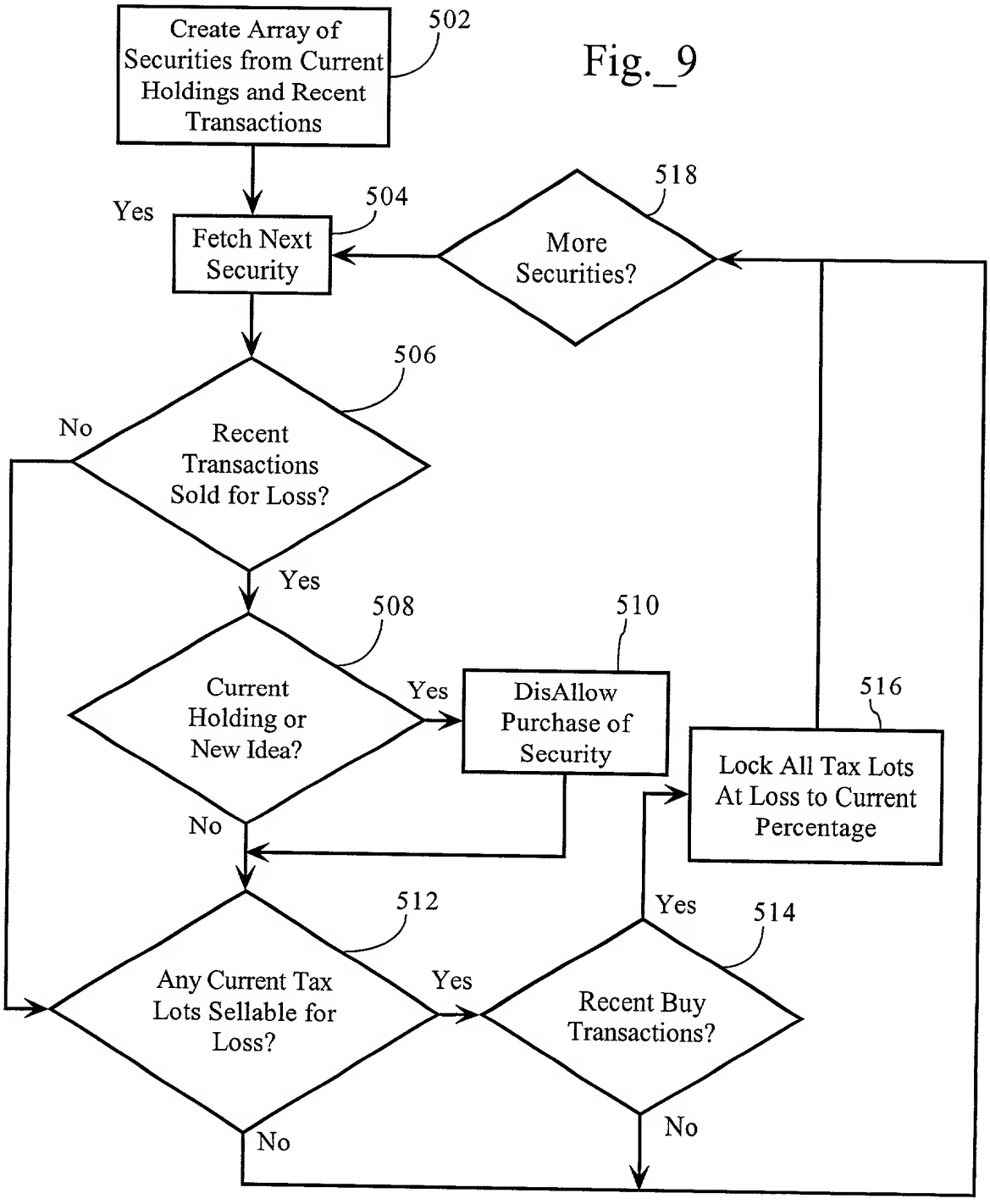

450
Fetch Next Model Portfolio
452
Restricted Securities?
Yes
454
Fetch Next Restricted Security
No
Yes
No
More Model Portfolios?
466
Done
456
Alternate Security?
No
Yes
463
More Restricted Securities?
Yes
No
458
Is Alternate Type = active risk equivalent?
No
Yes
460
Set Weight of Alternate Security to Weight of Restricted Security; Exclude Restricted Security from Model Portfolio
462
Set Weight of Alternate Security to 0 as new idea; set and lock weight of restricted security to 0.
464
Any "No Alternate" Restricted Securities?
No
Yes
468
Fetch next Security and Original Weight in Model Portfolio
470
Apportion Original Weight Equally Among All other Securities In Model Portfolio

Fig._8


Create Array of Securities from Current Holdings and Recent Transactions
502
Fig._9
Yes
Fetch Next Security
504
More Securities?
518
No
Recent Transactions Sold for Loss?
506
Yes
Current Holding or New Idea?
508
Yes
DisAllow Purchase of Security
510
516
Lock All Tax Lots At Loss to Current Percentage
No
Any Current Tax Lots Sellable for Loss?
512
Yes
Recent Buy Transactions?
514
Yes
No
No

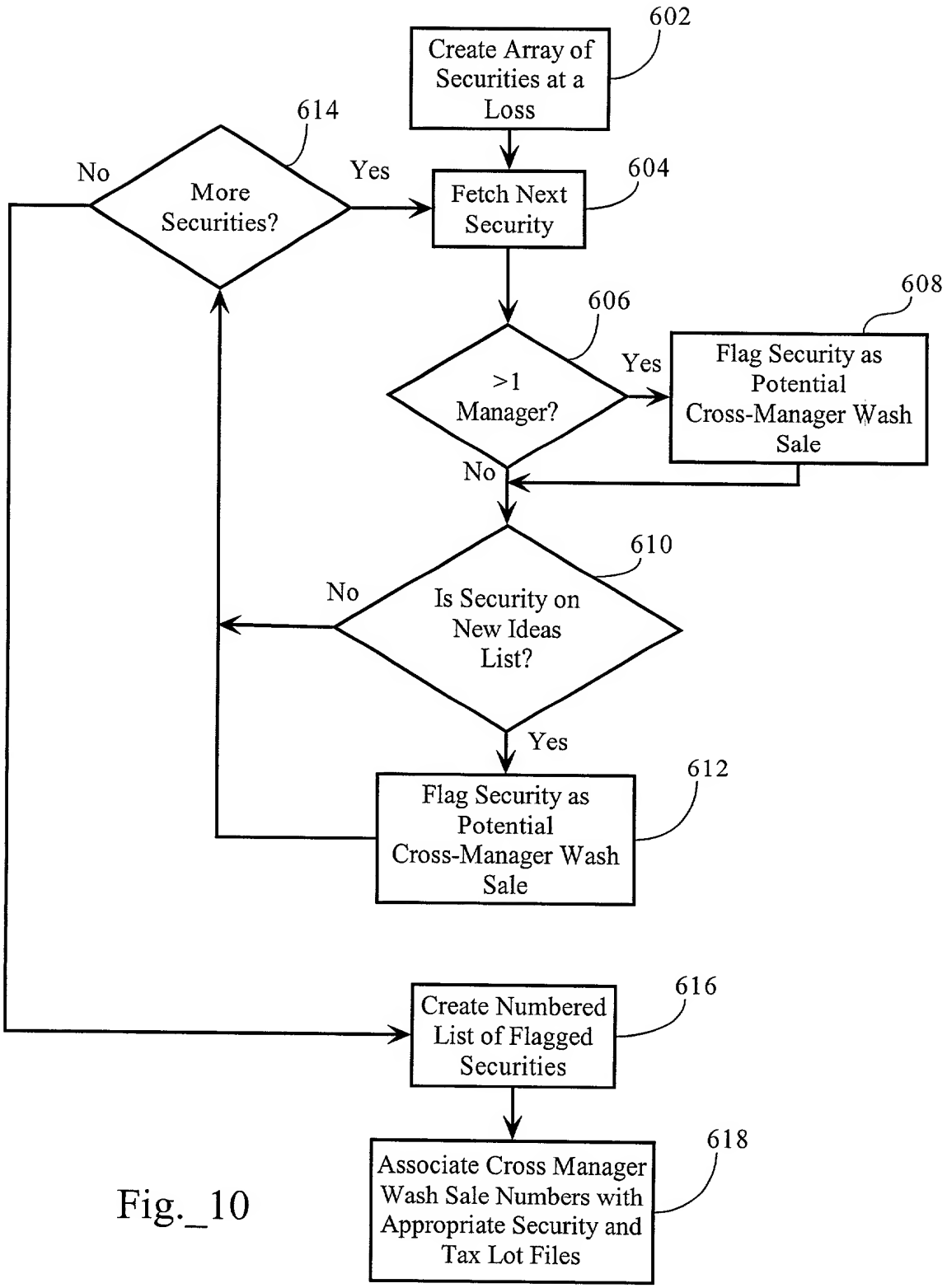

602
Create Array of Securities at a Loss
614
No
More Securities?
Yes
604
Fetch Next Security
606
608
>1 Manager?
Yes
Flag Security as Potential Cross-Manager Wash Sale
No
610
No
Is Security on New Ideas List?
Yes
612
Flag Security as Potential Cross-Manager Wash Sale
616
Create Numbered List of Flagged Securities
618
Associate Cross Manager Wash Sale Numbers with Appropriate Security and Tax Lot Files

Fig._10

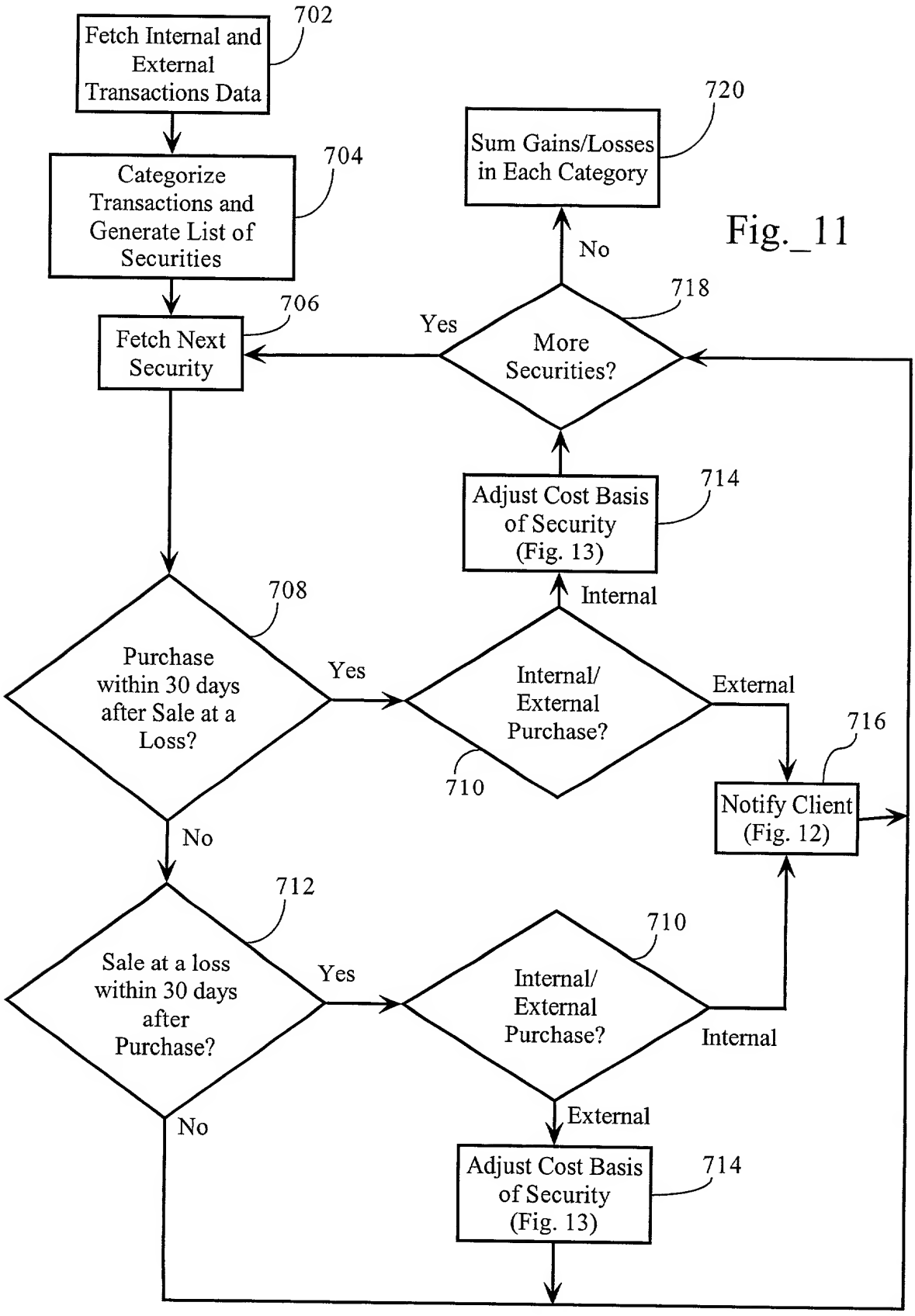

Fetch Internal and External Transactions Data
702
Categorize Transactions and Generate List of Securities
704
Fetch Next Security
706
Purchase within 30 days after Sale at a Loss?
708
Yes
No
Internal/ External Purchase?
710
External
Internal
Adjust Cost Basis of Security (Fig. 13)
714
More Securities?
718
Yes
No
Sum Gains/Losses in Each Category
720
Notify Client (Fig. 12)
716
Sale at a loss within 30 days after Purchase?
712
Yes
No
Internal/ External Purchase?
710
Internal
External
Adjust Cost Basis of Security (Fig. 13)
714

Fig._11

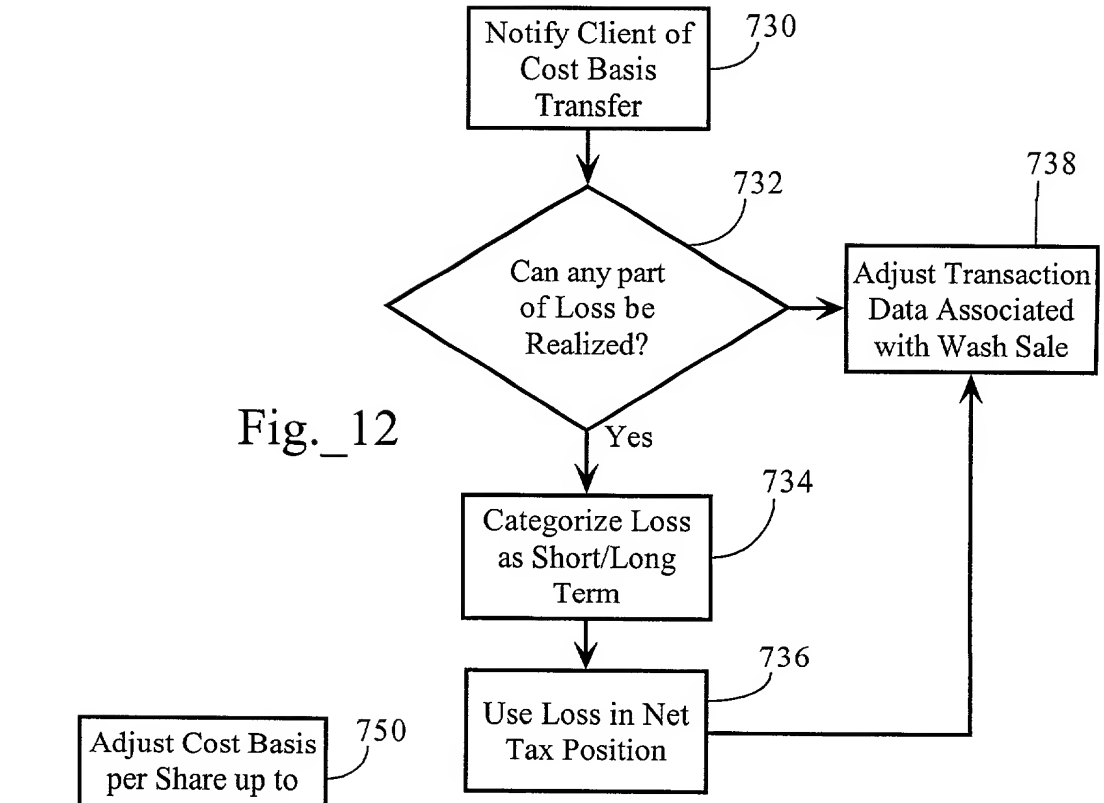

Notify Client of Cost Basis Transfer
730
Can any part of Loss be Realized?
732
Adjust Transaction Data Associated with Wash Sale
738
Yes
Categorize Loss as Short/Long Term
734
Use Loss in Net Tax Position
736

Fig._12

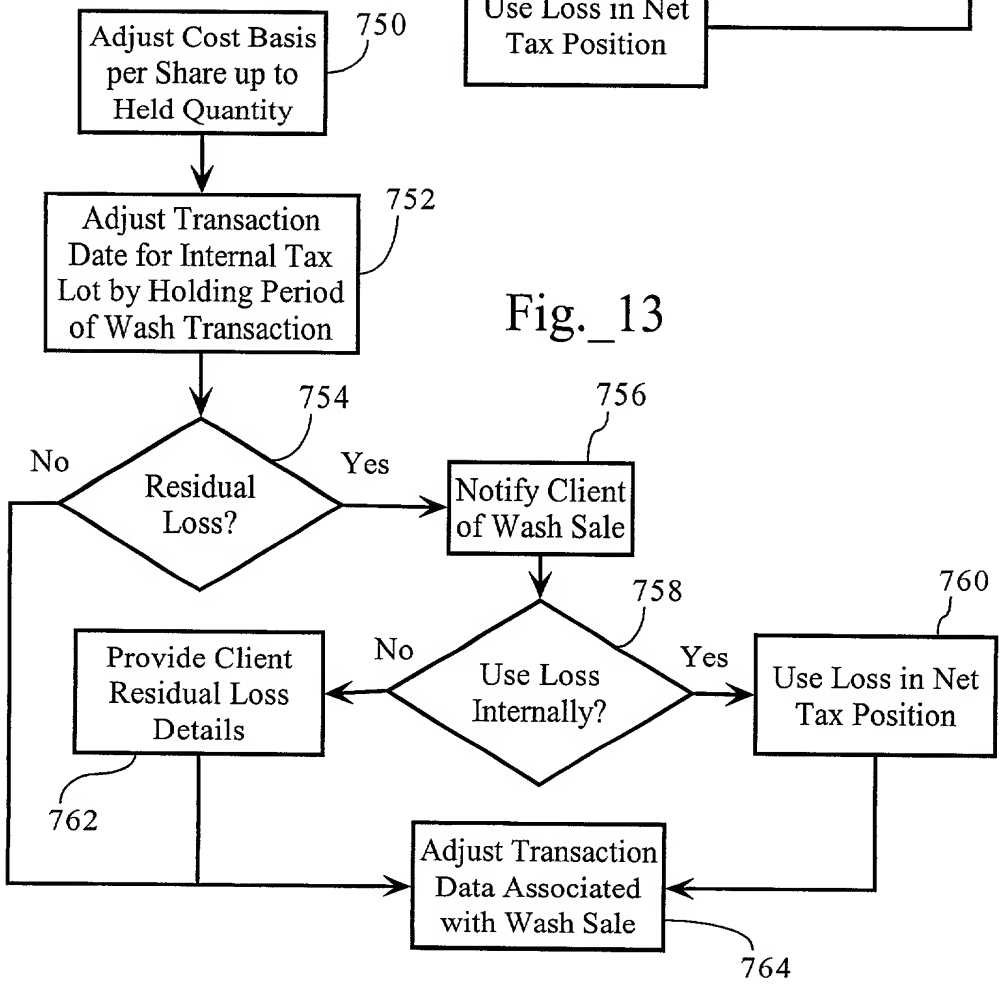

Adjust Cost Basis per Share up to Held Quantity
750
Adjust Transaction Date for Internal Tax Lot by Holding Period of Wash Transaction
752
Residual Loss?
754
No
Yes
Notify Client of Wash Sale
756
Use Loss Internally?
758
No
Yes
Use Loss in Net Tax Position
760
Provide Client Residual Loss Details
762
Adjust Transaction Data Associated with Wash Sale
764

Fig._13

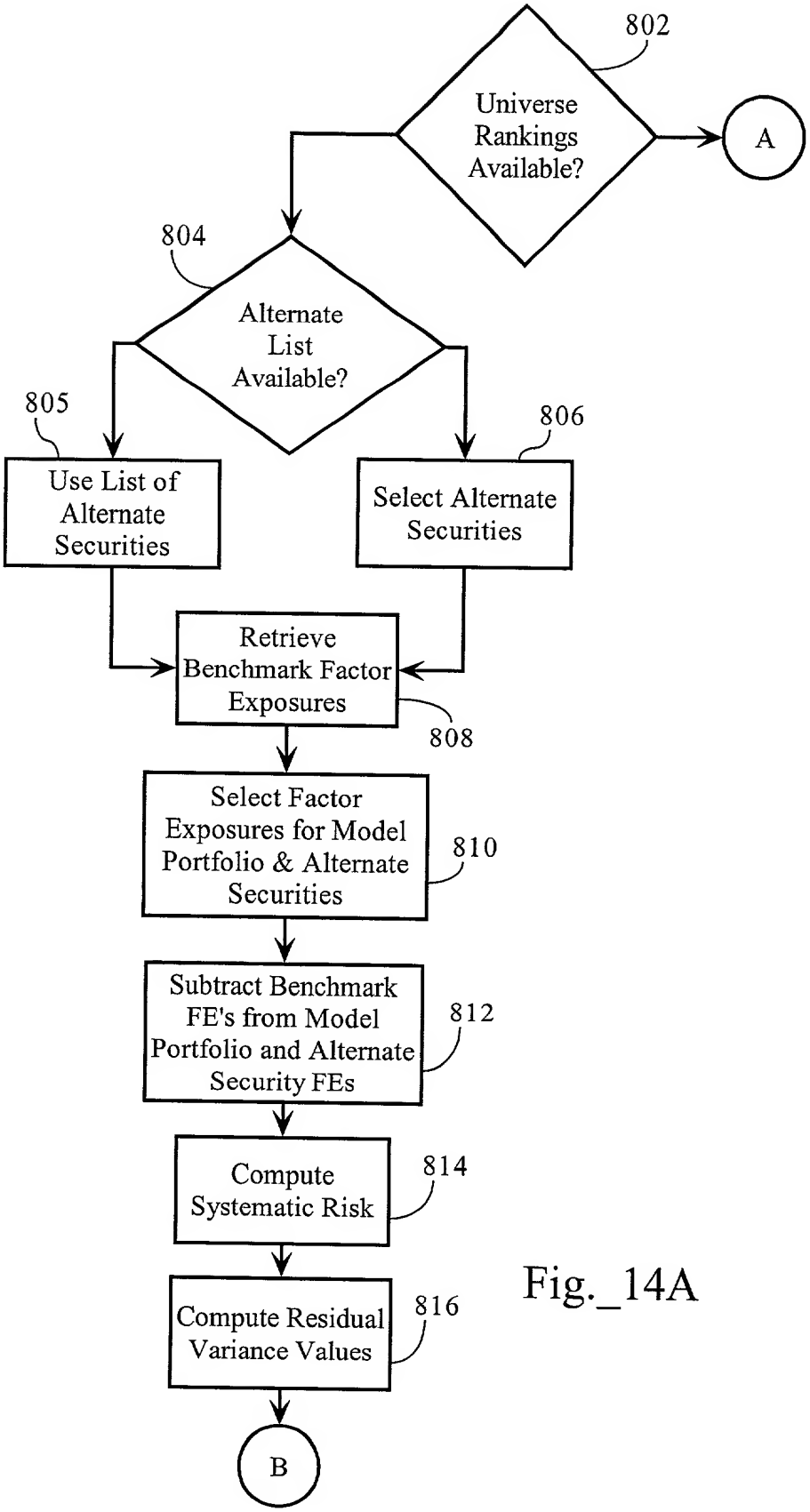

802
Universe Rankings Available?
A
804
Alternate List Available?
805
Use List of Alternate Securities
806
Select Alternate Securities
Retrieve Benchmark Factor Exposures
808
Select Factor Exposures for Model Portfolio & Alternate Securities
810
Subtract Benchmark FE's from Model Portfolio and Alternate Security FEs
812
Compute Systematic Risk
814
Compute Residual Variance Values
816
B

Fig._14A

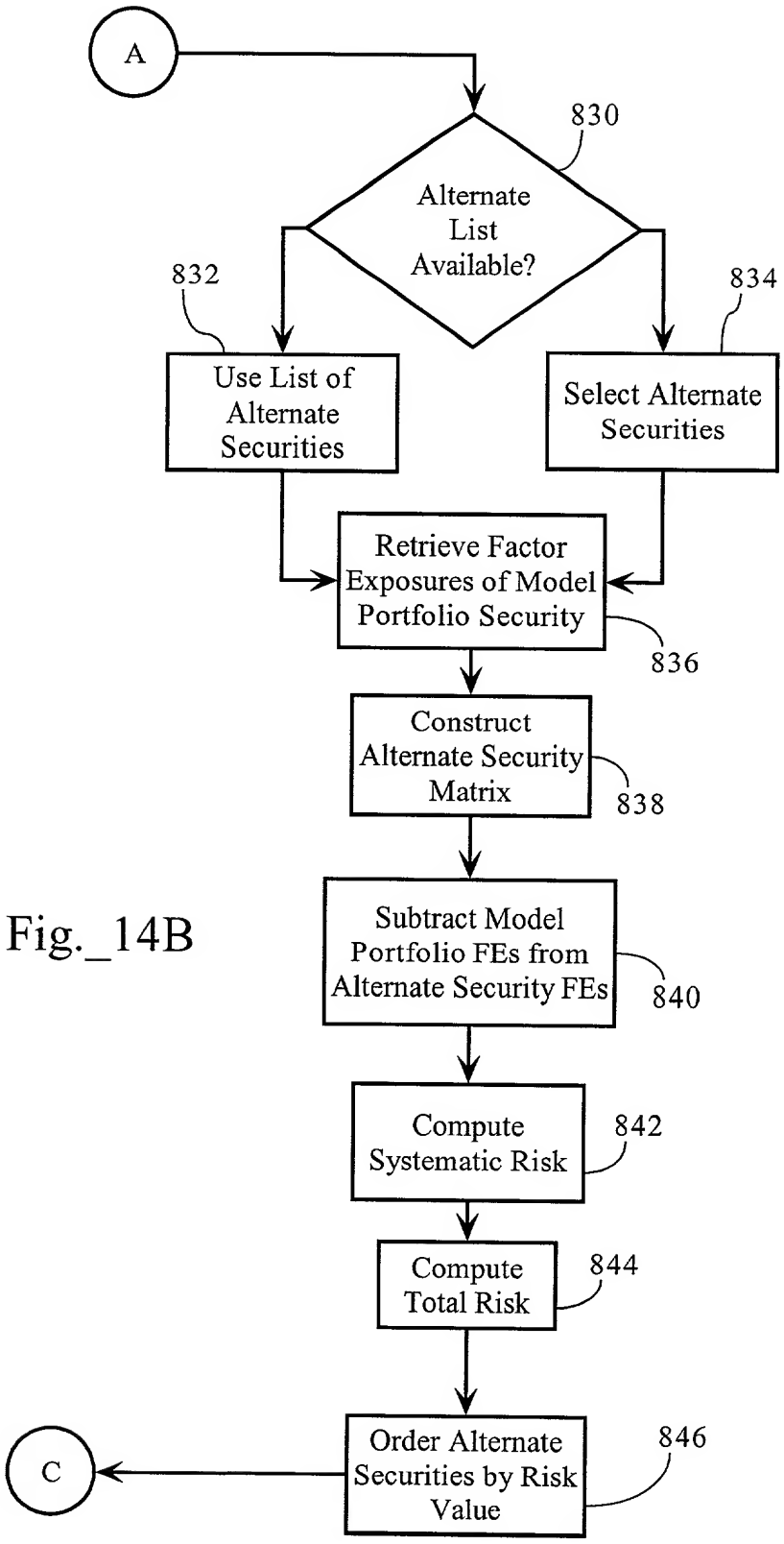

A
830
Alternate List Available?
832
834
Use List of Alternate Securities
Select Alternate Securities
Retrieve Factor Exposures of Model Portfolio Security
836
Construct Alternate Security Matrix
838
Subtract Model Portfolio FEs from Alternate Security FEs
840
Compute Systematic Risk
842
Compute Total Risk
844
Order Alternate Securities by Risk Value
846
C

Fig._14B

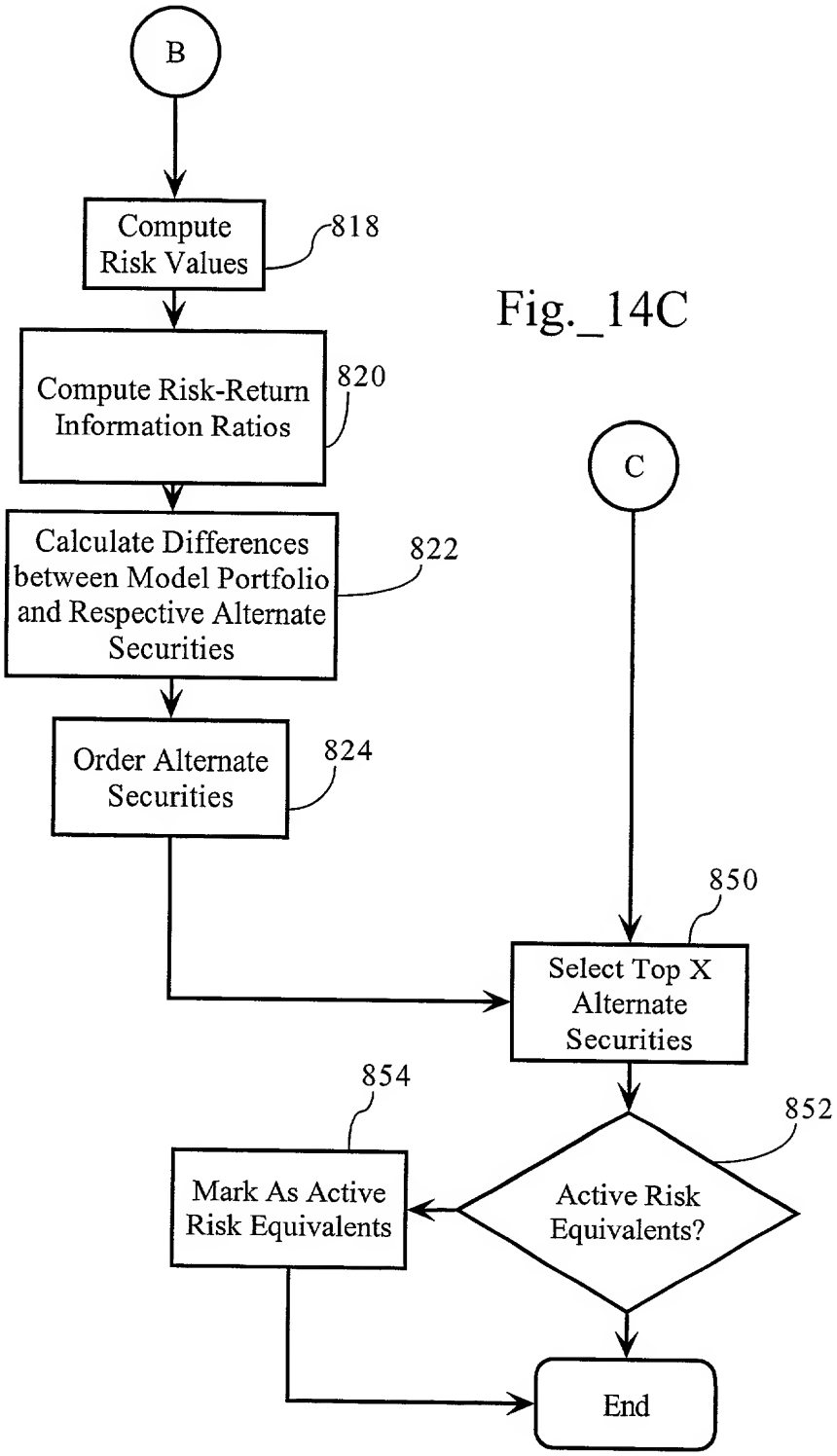

B
Compute Risk Values
818
Compute Risk-Return Information Ratios
820
Calculate Differences between Model Portfolio and Respective Alternate Securities
822
Order Alternate Securities
824
C
850
Select Top X Alternate Securities
852
Active Risk Equivalents?
854
Mark As Active Risk Equivalents
End

Fig._14C

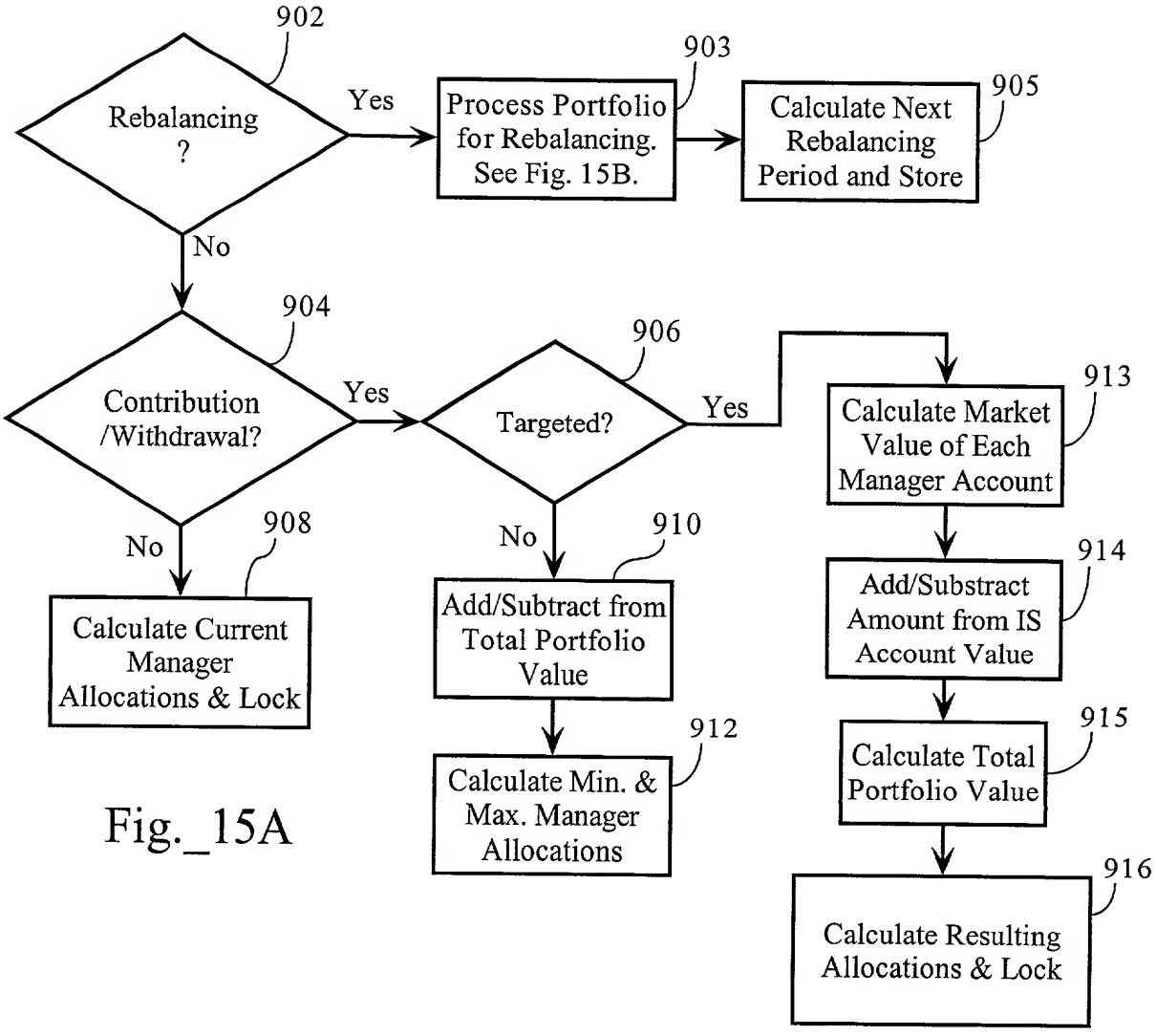

902
Rebalancing ?
Yes
903
Process Portfolio for Rebalancing. See Fig. 15B.
905
Calculate Next Rebalancing Period and Store
No
904
Contribution /Withdrawal?
Yes
906
Targeted?
Yes
913
Calculate Market Value of Each Manager Account
No
908
Calculate Current Manager Allocations & Lock
No
910
Add/Subtract from Total Portfolio Value
914
Add/Substract Amount from IS Account Value
912
Calculate Min. & Max. Manager Allocations
915
Calculate Total Portfolio Value
916
Calculate Resulting Allocations & Lock

Fig._15A

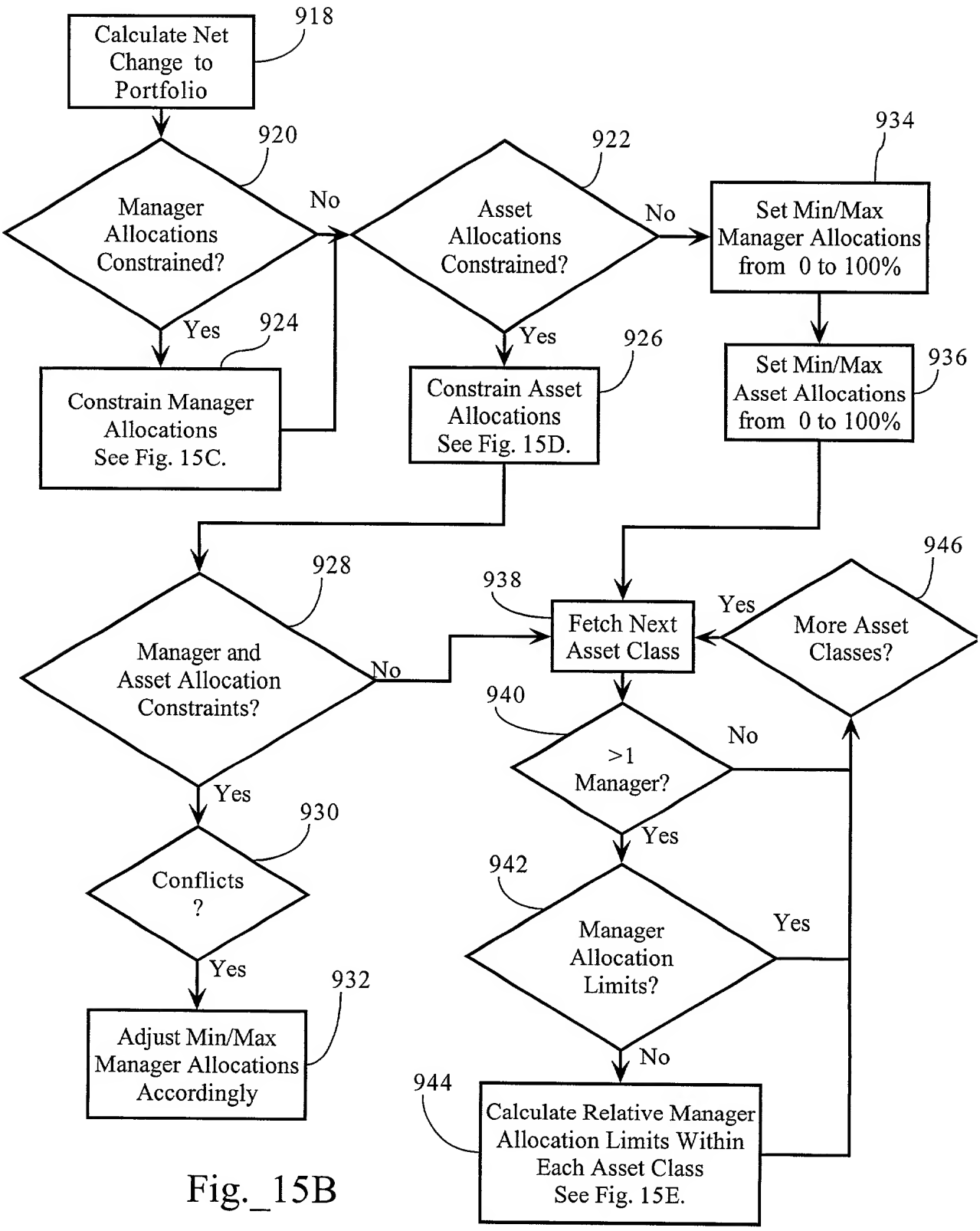

Calculate Net Change to Portfolio
918
Manager Allocations Constrained?
920
No
Yes
924
Constrain Manager Allocations See Fig. 15C.
Asset Allocations Constrained?
922
No
Yes
926
Constrain Asset Allocations See Fig. 15D.
Set Min/Max Manager Allocations from 0 to 100%
934
Set Min/Max Asset Allocations from 0 to 100%
936
Manager and Asset Allocation Constraints?
928
No
Yes
Conflicts ?
930
Yes
Adjust Min/Max Manager Allocations Accordingly
932
Fetch Next Asset Class
938
More Asset Classes?
946
Yes
>1 Manager?
940
No
Yes
Manager Allocation Limits?
942
Yes
No
Calculate Relative Manager Allocation Limits Within Each Asset Class See Fig. 15E.
944

Fig._15B

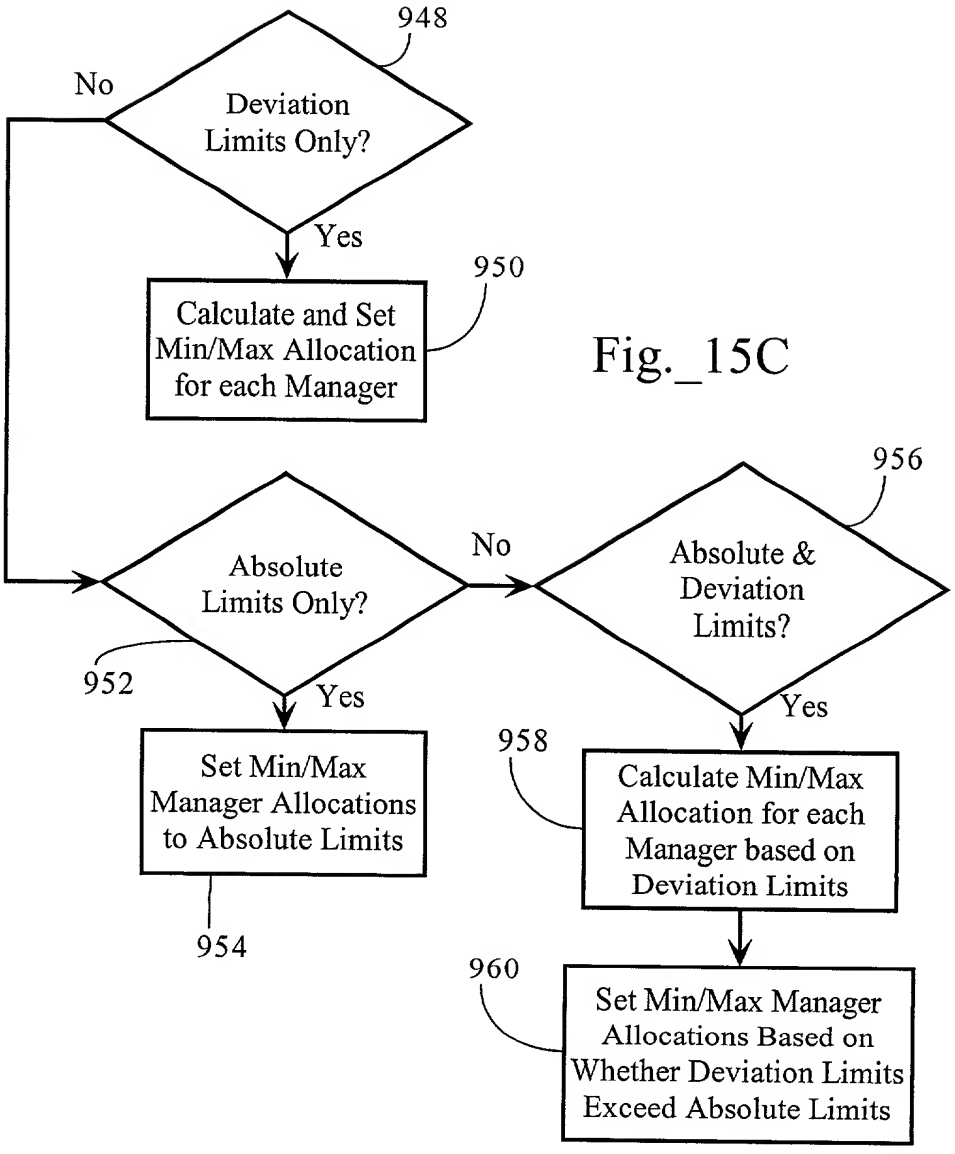

948
Deviation Limits Only?
No
Yes
950
Calculate and Set Min/Max Allocation for each Manager
Absolute Limits Only?
952
Yes
Set Min/Max Manager Allocations to Absolute Limits
954
No
956
Absolute & Deviation Limits?
Yes
958
Calculate Min/Max Allocation for each Manager based on Deviation Limits
960
Set Min/Max Manager Allocations Based on Whether Deviation Limits Exceed Absolute Limits

Fig._15C

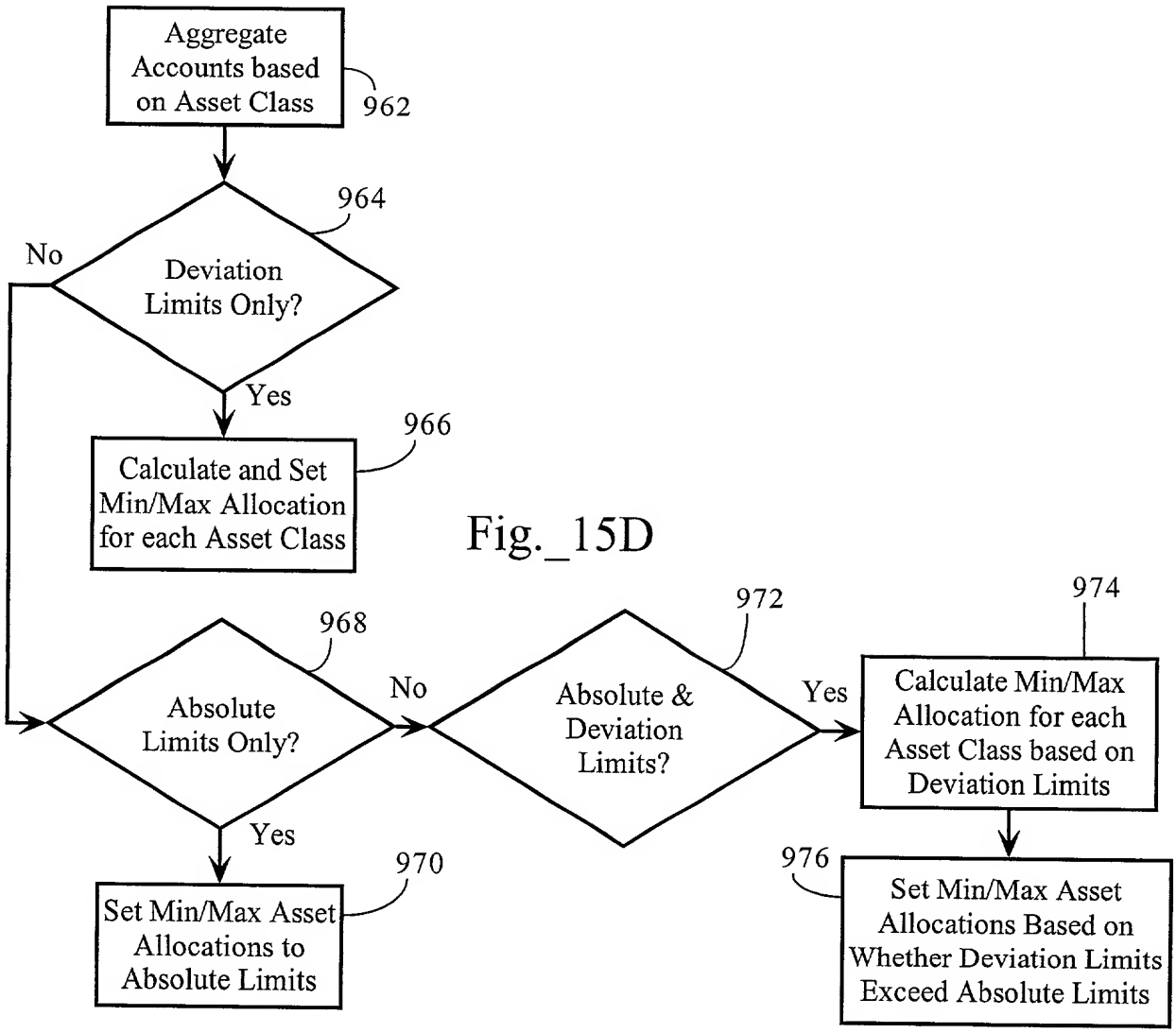

Aggregate Accounts based on Asset Class
962
964
Deviation Limits Only?
No
Yes
966
Calculate and Set Min/Max Allocation for each Asset Class
968
Absolute Limits Only?
No
Yes
970
Set Min/Max Asset Allocations to Absolute Limits
972
Absolute & Deviation Limits?
Yes
974
Calculate Min/Max Allocation for each Asset Class based on Deviation Limits
976
Set Min/Max Asset Allocations Based on Whether Deviation Limits Exceed Absolute Limits

Fig._15D

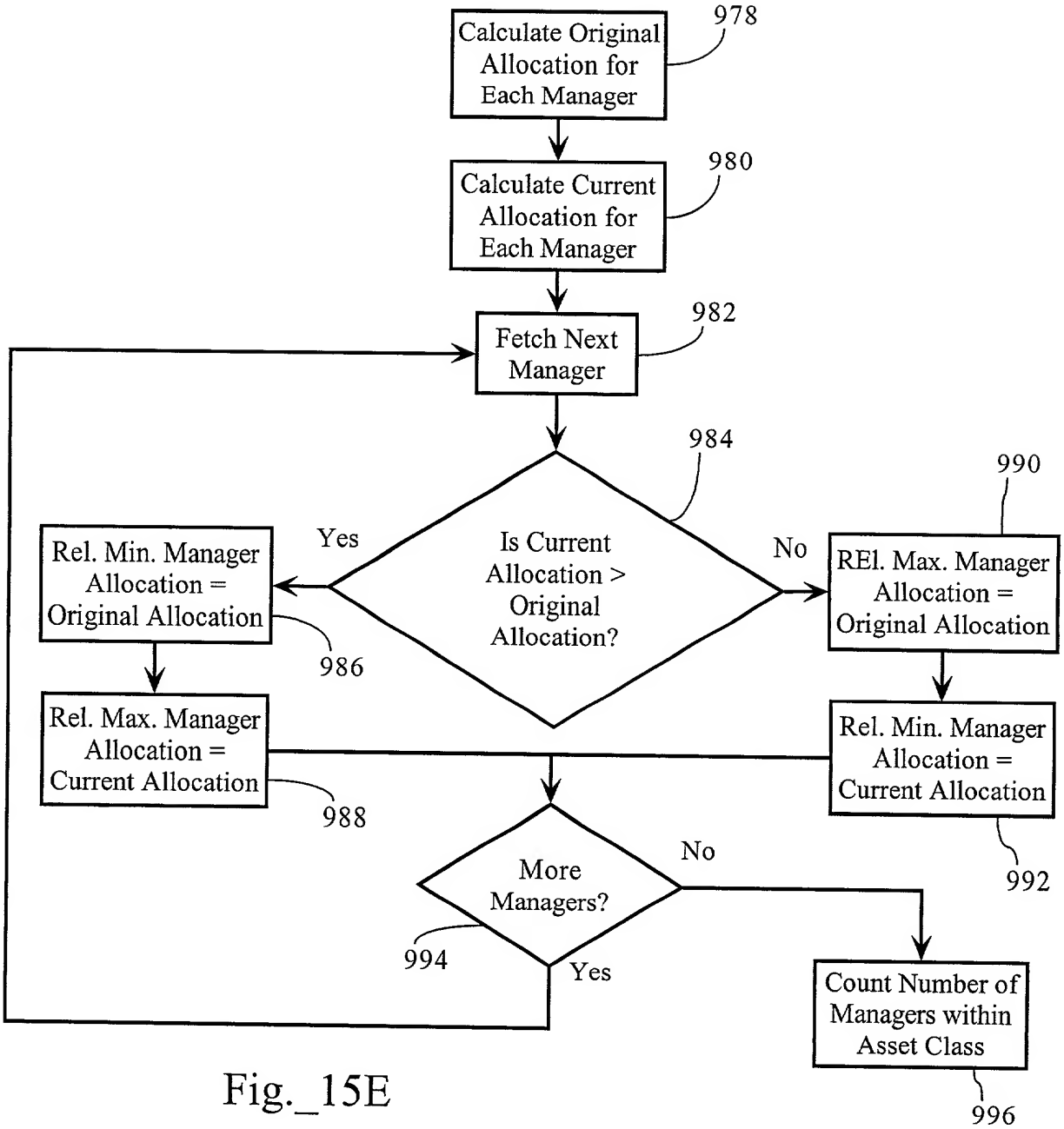
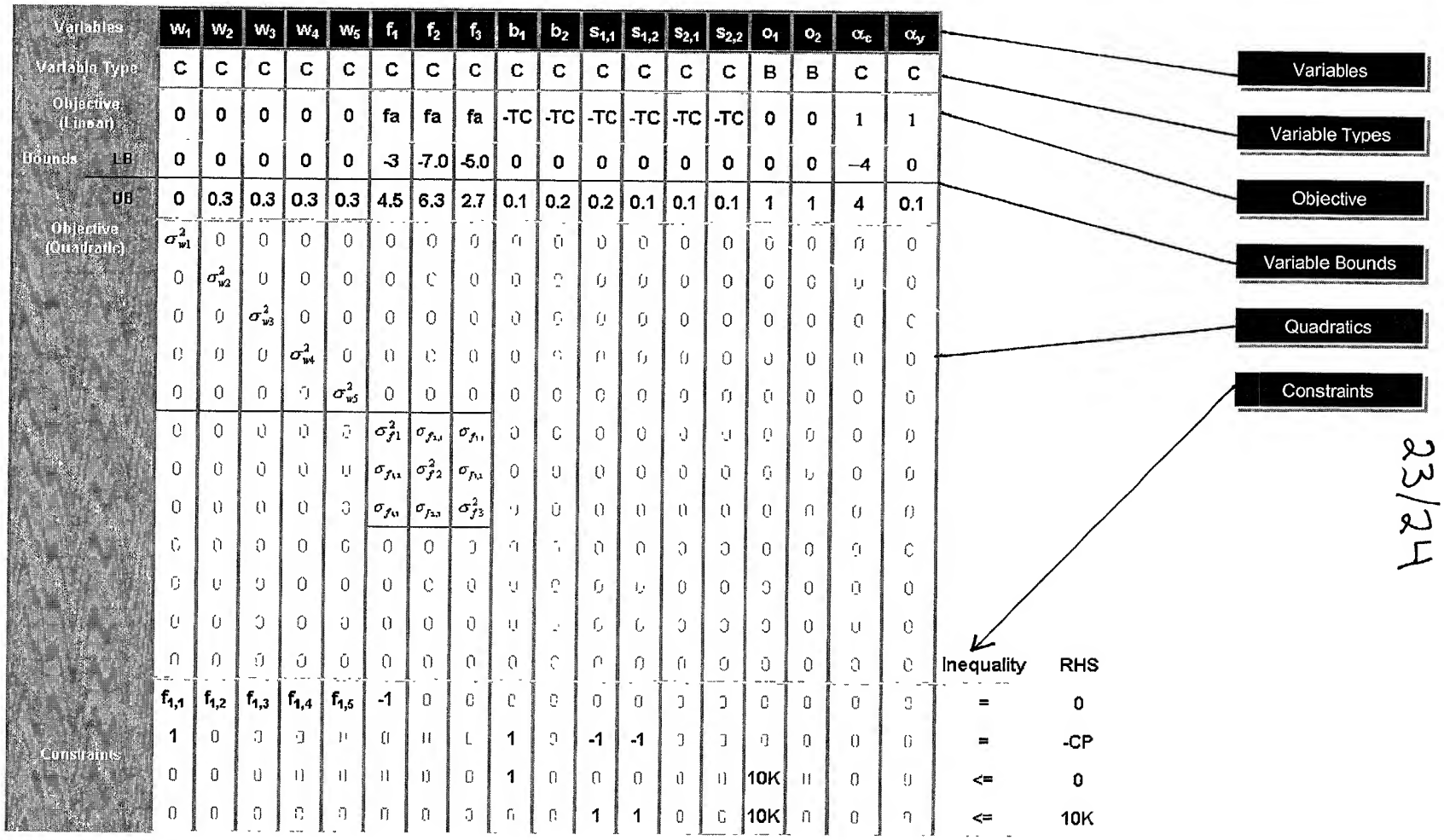
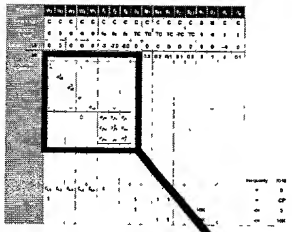

Calculate Original Allocation for Each Manager
978
Calculate Current Allocation for Each Manager
980
Fetch Next Manager
982
Is Current Allocation > Original Allocation?
984
Yes
No
Rel. Min. Manager Allocation = Original Allocation
986
REl. Max. Manager Allocation = Original Allocation
990
Rel. Max. Manager Allocation = Current Allocation
988
Rel. Min. Manager Allocation = Current Allocation
992
More Managers?
994
No
Yes
Count Number of Managers within Asset Class
996

Fig._15E



Variables	w_1	w_2	w_3	w_4	w_5	f_1	f_2	f_3	b_1	b_2	$s_{1,1}$	$s_{1,2}$	$s_{2,1}$	$s_{2,2}$	o_1	o_2	α_c	α_y		
Variable Type	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	B	C	C		
Objective (Linear)	0	0	0	0	0	fa	fa	fa	-TC	-TC	-TC	-TC	-TC	-TC	0	0	1	1		
Bounds LB	0	0	0	0	0	-3	-7.0	-5.0	0	0	0	0	0	0	0	0	−4	0		
UB	0	0.3	0.3	0.3	0.3	4.5	6.3	2.7	0.1	0.2	0.2	0.1	0.1	0.1	1	1	4	0.1		
Objective (Quadratic)	σ^2_{w1}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	σ^2_{w2}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	σ^2_{w3}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	0	σ^2_{w4}	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	σ^2_{w5}	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	σ^2_{f1}	$\sigma_{f1,2}$	$\sigma_{f1,3}$	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	$\sigma_{f1,2}$	σ^2_{f2}	$\sigma_{f2,3}$	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	$\sigma_{f1,3}$	$\sigma_{f2,3}$	σ^2_{f3}	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Constraints	$f_{1,1}$	$f_{1,2}$	$f_{1,3}$	$f_{1,4}$	$f_{1,5}$	-1	0	0	0	0	0	0	0	0	0	0	0	0	=	0
	1	0	0	0	0	0	0	0	1	0	-1	-1	0	0	0	0	0	0	=	-CP
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	10K	0	0	0	<=	0
	0	0	0	0	0	0	0	0	0	0	1	1	0	0	10K	0	0	0	<=	10K

Fig._16



	w_1	w_2	w_3	w_4	w_5	F_1	F_2	F_3	b_1
w_1	$-\lambda_u\sigma^2_{w1}$	0	0	0	0	0	0	0	0
w_2	0	$-\lambda_u\sigma^2_{w2}$	0	0	0	0	0	0	0
w_3	0	0	$-\lambda_u\sigma^2_{w3}$	0	0	0	0	0	0
w_4	0	0	0	$-\lambda_u\sigma^2_{w4}$	0	0	0	0	0
w_5	0	0	0	0	$-\lambda_u\sigma^2_{w5}$	0	0	0	0
F_1	0	0	0	0	0	$-\lambda_s\sigma^2_{F_1}$	$-\lambda_s\sigma_{F_{2,1}}$	$-\lambda_s\sigma_{F_{3,1}}$	0
F_2	0	0	0	0	0	$-\lambda_s\sigma_{F_{1,2}}$	$-\lambda_s\sigma^2_{F_2}$	$-\lambda_s\sigma_{F_{3,2}}$	0
F_3	0	0	0	0	0	$-\lambda_s\sigma_{F_{1,3}}$	$-\lambda_s\sigma_{F_{2,3}}$	$-\lambda_s\sigma^2_{F_3}$	0
b_1	0	0	0	0	0	0	0	0	0

Fig._17